

U.S. Patent Application Serial No. 10/618,717
Amendment filed May 6, 2005
Reply to OA dated February 16, 2005

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1. (Currently Amended): A field-effect transistor comprising:

a channel layer that is formed on a predetermined semiconductor layer and has an impurity concentration varying from a low value to a high value; and
a source region and a drain region each having a bottom face above an interface between the predetermined semiconductor layer and the channel layer and provided within the channel layer.

Claim 2. (Original): The field-effect transistor as claimed in claim 1, wherein the impurity concentration varies linearly or exponentially.

Claim 3. (Original): The field-effect transistor as claimed in claim 1, wherein the impurity concentration is $1.0 \times 10^{16}/\text{cm}^3$ or higher.

Claim 4. (Original): The field-effect transistor as claimed in claim 1, wherein the impurity contained in the channel layer is at least one of selenium, silicon, carbon, beryllium, and magnesium.

U.S. Patent Application Serial No. 10/618,717
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Claim 5. (Currently Amended): A field-effect transistor comprising:
a channel layer that is formed on a predetermined semiconductor layer and has a composition ratio varying in which a saturation electron velocity varies from a low value to a high value as getting away from the predetermined semiconductor layer; and
a source region and a drain region each having a bottom face above the predetermined semiconductor layer.

Claim 6. (Original): The field-effect transistor as claimed in claim 5, wherein the channel layer has the composition ratio of a predetermined material linearly or exponentially decreasing or increasing as the distance from the predetermined semiconductor layer increases.

Claim 7. (Original): The field-effect transistor as claimed in claim 5, wherein the predetermined material is at least one of gallium, indium, aluminum, and antimony.

Claim 8. (Original): The field-effect transistor as claimed in claim 1, wherein:
the predetermined semiconductor layer is a buffer layer that is formed on a semiconductor substrate;
and
the bottom faces of the source region and the drain region are located within the channel layer.

U.S. Patent Application Serial No. 10/618,717
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Claim 9. (Withdrawn): A method of producing a field-effect transistor, comprising the steps of:

growing a channel layer on a predetermined semiconductor layer, while varying an impurity concentration from a low value to a high value; and
forming a source region and a drain region each having a bottom face above the predetermined semiconductor layer.

Claim 10. (Withdrawn): The method as claimed in claim 9, wherein the step of growing a channel layer includes linearly or exponentially increasing the impurity concentration during the growth of the channel layer.

Claim 11. (Withdrawn): The method as claimed in claim 9, wherein the step of growing a channel layer includes linearly or exponentially increasing the temperature of an effusion cell for the impurity to be introduced into the channel layer.

Claim 12. (Withdrawn): The method as claimed in claim 9, wherein the impurity is at least one of selenium, silicon, carbon, beryllium, and magnesium.

U.S. Patent Application Serial No. 10/618,717
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Claim 13. (Withdrawn): A method of producing a field-effect transistor, comprising the steps of:

growing a channel layer on a predetermined semiconductor layer, while varying the composition ratio of a predetermined composition from a low value to a high value; and
forming a source region and a drain region each having a bottom face above the predetermined semiconductor layer.

Claim 14. (Withdrawn): The method as claimed in claim 13, wherein the step of growing a channel layer includes linearly or exponentially increasing or decreasing the flow rate of a gas containing a predetermined organic metal.

Claim 15. (Withdrawn): The method as claimed in claim 14, wherein the predetermined organic metal is trimethylgallium and/or triethylgallium, trimethylindium, trimethylaluminum, or trimethylantimony.

Claim 16. (Withdrawn): The method as claimed in claim 13, wherein the step of growing a channel layer includes linearly or exponentially increasing or decreasing the temperature of an effusion cell for the material that forms the predetermined composition.

U.S. Patent Application Serial No. 10/618,717
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Claim 17. (Withdrawn): The method as claimed in claim 13, wherein the predetermined composition is at least one of a gallium composition, an indium composition, an antimony composition, and an aluminum composition.

Claim 18. (Withdrawn): The method as claimed in claim 9, wherein the step of forming a source region and a drain region includes implanting predetermined ions to such a depth that does not reach the predetermined semiconductor layer.